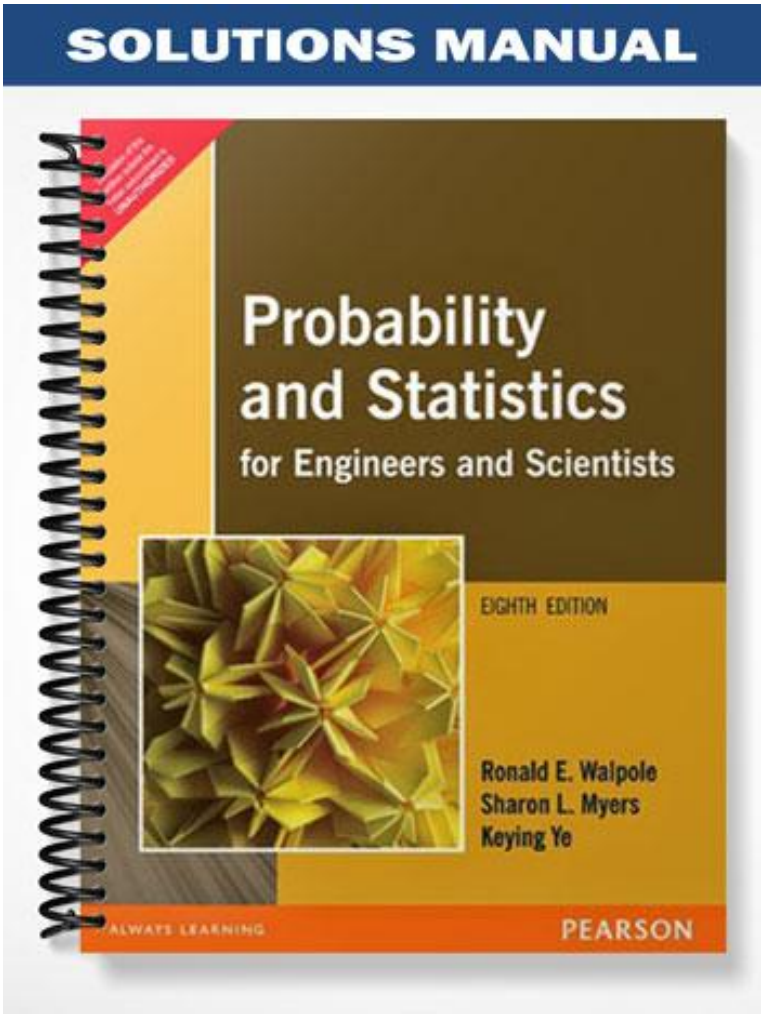
SOLUTIONS MANUAL



INSTRUCTOR'S SOLUTION MANUAL

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for

PROBABILITY & STATISTICS
FOR ENGINEERS & SCIENTISTS

EIGHTH EDITION

WALPOLE, MYERS, MYERS, YE

Contents

Chapter 1

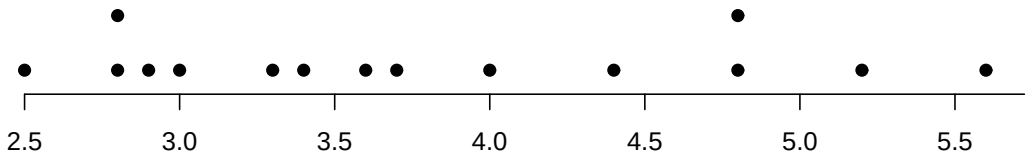
Introduction to Statistics and Data Analysis

1.1 (a) 15.

(b) $\bar{x} = \frac{1}{15}(3.4 + 2.5 + 4.8 + \cdots + 4.8) = 3.787$.

(c) Sample median is the 8th value, after the data is sorted from smallest to largest: 3.6.

(d) A dot plot is shown below.



(e) After trimming total 40% of the data (20% highest and 20% lowest), the data becomes:

2.9	3.0	3.3	3.4	3.6
3.7	4.0	4.4	4.8	

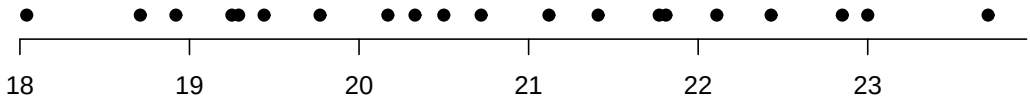
So. the trimmed mean is

$$\bar{x}_{\text{tr20}} = \frac{1}{9}(2.9 + 3.0 + \cdots + 4.8) = 3.678.$$

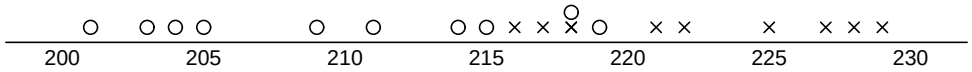
1.2 (a) Mean=20.768 and Median=20.610.

(b) $\bar{x}_{\text{tr10}} = 20.743$.

(c) A dot plot is shown below.



1.3 (a) A dot plot is shown below.



In the figure, "×" represents the "No aging" group and "○" represents the "Aging" group.

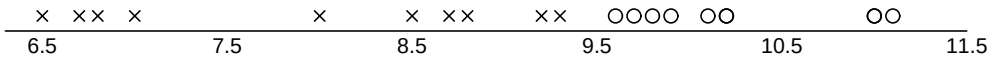
(b) Yes; tensile strength is greatly reduced due to the aging process.

(c) $\text{Mean}_{\text{Aging}} = 209.90$, and $\text{Mean}_{\text{No aging}} = 222.10$.

(d) $\text{Median}_{\text{Aging}} = 210.00$, and $\text{Median}_{\text{No aging}} = 221.50$. The means and medians for each group are similar to each other.

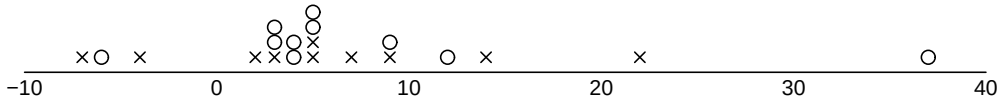
1.4 (a) $\bar{X}_A = 7.950$ and $\tilde{X}_A = 8.250$;
$\bar{X}_B = 10.260$ and $\tilde{X}_B = 10.150$.

(b) A dot plot is shown below.



In the figure, "×" represents company A and "○" represents company B. The steel rods made by company B show more flexibility.

1.5 (a) A dot plot is shown below.

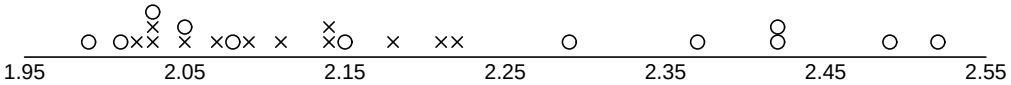


In the figure, "×" represents the control group and "○" represents the treatment group.

(b) $\bar{X}_{\text{Control}} = 5.60$, $\tilde{X}_{\text{Control}} = 5.00$, and $\bar{X}_{\text{tr(10);Control}} = 5.13$;
$\bar{X}_{\text{Treatment}} = 7.60$, $\tilde{X}_{\text{Treatment}} = 4.50$, and $\bar{X}_{\text{tr(10);Treatment}} = 5.63$.

(c) The difference of the means is 2.0 and the differences of the medians and the trimmed means are 0.5, which are much smaller. The possible cause of this might be due to the extreme values (outliers) in the samples, especially the value of 37.

1.6 (a) A dot plot is shown below.



In the figure, "×" represents the 20°C group and "○" represents the 45°C group.

(b) $\bar{X}_{20°\text{C}} = 2.1075$, and $\bar{X}_{45°\text{C}} = 2.2350$.

(c) Based on the plot, it seems that high temperature yields more high values of tensile strength, along with a few low values of tensile strength. Overall, the temperature does have an influence on the tensile strength.

(d) It also seems that the variation of the tensile strength gets larger when the cure temperature is increased.

1.7 $s^2 = \frac{1}{15-1}[(3.4-3.787)^2+(2.5-3.787)^2+(4.8-3.787)^2+\cdots+(4.8-3.787)^2] = 0.94284$;
$s = \sqrt{s^2} = \sqrt{0.9428} = 0.971$.

1.8 $s^2 = \frac{1}{20-1}[(18.71-20.768)^2 + (21.41-20.768)^2 + \cdots + (21.12-20.768)^2] = 2.5345$;
$s = \sqrt{2.5345} = 1.592$.

1.9 $s^2_{\text{No Aging}} = \frac{1}{10-1}[(227-222.10)^2 + (222-222.10)^2 + \cdots + (221-222.10)^2] = 42.12$;
$s_{\text{No Aging}} = \sqrt{42.12} = 6.49$.
$s^2_{\text{Aging}} = \frac{1}{10-1}[(219-209.90)^2 + (214-209.90)^2 + \cdots + (205-209.90)^2] = 23.62$;
$s_{\text{Aging}} = \sqrt{23.62} = 4.86$.

1.10 For company A: $s_A^2 = 1.2078$ and $s_A = \sqrt{1.2078} = 1.099$.
For company B: $s_B^2 = 0.3249$ and $s_B = \sqrt{0.3249} = 0.570$.

1.11 For the control group: $s^2_{\text{Control}} = 69.39$ and $s_{\text{Control}} = 8.33$.
For the treatment group: $s^2_{\text{Treatment}} = 128.14$ and $s_{\text{Treatment}} = 11.32$.

1.12 For the cure temperature at 20°C: $s^2_{20°\text{C}} = 0.005$ and $s_{20°\text{C}} = 0.071$.
For the cure temperature at 45°C: $s^2_{45°\text{C}} = 0.0413$ and $s_{45°\text{C}} = 0.2032$.
The variation of the tensile strength is influenced by the increase of cure temperature.

1.13 (a) Mean $= \bar{X} = 124.3$ and median $= \tilde{X} = 120$;

(b) 175 is an extreme observation.

1.14 (a) Mean $= \bar{X} = 570.5$ and median $= \tilde{X} = 571$;

(b) Variance $= s^2 = 10$; standard deviation$= s = 3.162$; range=10;

(c) Variation of the diameters seems too big.

1.15 Yes. The value 0.03125 is actually a P-value and a small value of this quantity means that the outcome (i.e., $HHHHH$) is very unlikely to happen with a fair coin.

1.16 The term on the left side can be manipulated to

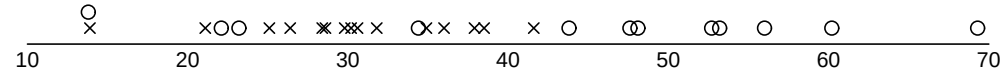
$$\sum_{i=1}^{n} x_i - n\bar{x} = \sum_{i=1}^{n} x_i - \sum_{i=1}^{n} x_i = 0,$$

which is the term on the right side.

1.17 (a) $\bar{X}_{\text{smokers}} = 43.70$ and $\bar{X}_{\text{nonsmokers}} = 30.32$;

(b) $s_{\text{smokers}} = 16.93$ and $s_{\text{nonsmokers}} = 7.13$;

(c) A dot plot is shown below.



In the figure, "×" represents the nonsmoker group and "○" represents the smoker group.

(d) Smokers appear to take longer time to fall asleep and the time to fall asleep for smoker group is more variable.

1.18 (a) A stem-and-leaf plot is shown below.

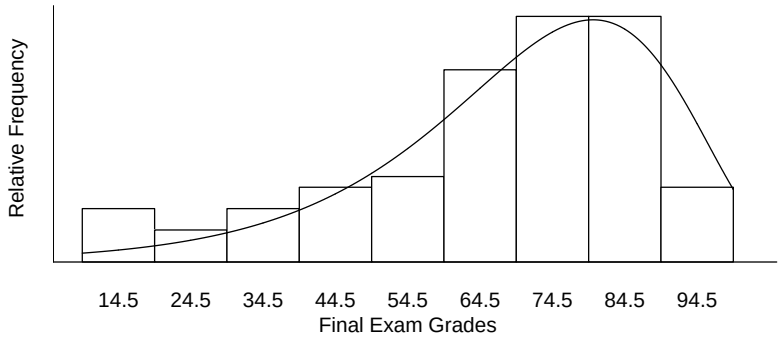
Stem	Leaf	Frequency
1	057	3
2	35	2
3	246	3
4	1138	4
5	22457	5
6	00123445779	11
7	01244456678899	14
8	00011223445589	14
9	0258	4

(b) The following is the relative frequency distribution table.

Relative Frequency Distribution of Grades

Class Interval	Class Midpoint	Frequency, f	Relative Frequency
$10-19$	14.5	3	0.05
$20-29$	24.5	2	0.03
$30-39$	34.5	3	0.05
$40-49$	44.5	4	0.07
$50-59$	54.5	5	0.08
$60-69$	64.5	11	0.18
$70-79$	74.5	14	0.23
$80-89$	84.5	14	0.23
$90-99$	94.5	4	0.07

(c) A histogram plot is given below.



The distribution skews to the left.

(d) $\bar{X} = 65.48$, $\tilde{X} = 71.50$ and $s = 21.13$.

1.19 (a) A stem-and-leaf plot is shown below.

Stem	Leaf	Frequency
0	22233457	8
1	023558	6
2	035	3
3	03	2
4	057	3
5	0569	4
6	0005	4

(b) The following is the relative frequency distribution table.

Relative Frequency Distribution of Years

Class Interval	Class Midpoint	Frequency, f	Relative Frequency
$0.0 - 0.9$	0.45	8	0.267
$1.0 - 1.9$	1.45	6	0.200
$2.0 - 2.9$	2.45	3	0.100
$3.0 - 3.9$	3.45	2	0.067
$4.0 - 4.9$	4.45	3	0.100
$5.0 - 5.9$	5.45	4	0.133
$6.0 - 6.9$	6.45	4	0.133

(c) $\bar{X} = 2.797$, $s = 2.227$ and Sample range is $6.5 - 0.2 = 6.3$.

1.20 (a) A stem-and-leaf plot is shown next.

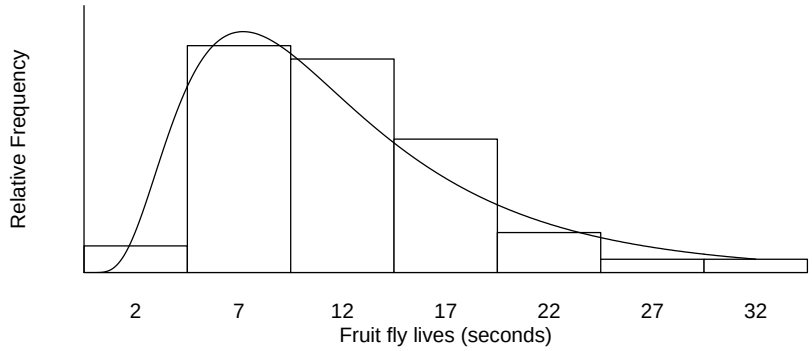
Stem	Leaf	Frequency
0*	34	2
0	56667777777889999	17
1*	0000001223333344	16
1	5566788899	10
2*	034	3
2	7	1
3*	2	1

(b) The relative frequency distribution table is shown next.

Relative Frequency Distribution of Fruit Fly Lives

Class Interval	**Class Midpoint**	**Frequency, f**	**Relative Frequency**
$0-4$	2	2	0.04
$5-9$	7	17	0.34
$10-14$	12	16	0.32
$15-19$	17	10	0.20
$20-24$	22	3	0.06
$25-29$	27	1	0.02
$30-34$	32	1	0.02

(c) A histogram plot is shown next.



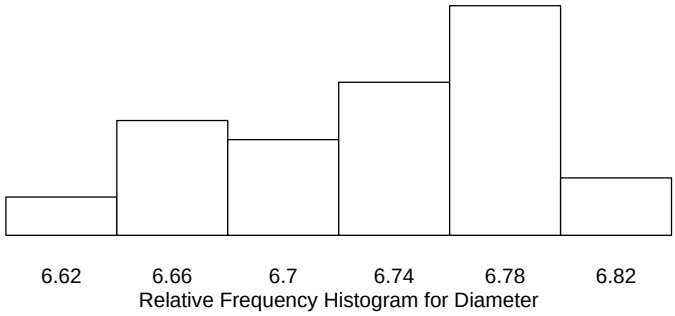
(d) $\tilde{X} = 10.50$.

1.21 (a) $\bar{X} = 1.7743$ and $\tilde{X} = 1.7700$;

(b) $s = 0.3905$.

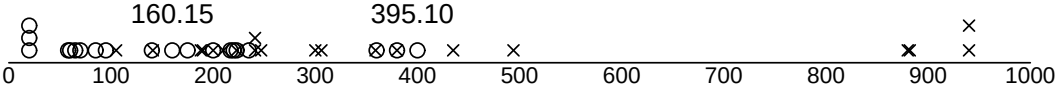
1.22 (a) $\bar{X} = 6.7261$ and $\tilde{X} = 0.0536$.

(b) A histogram plot is shown next.



(c) The data appear to be skewed to the left.

1.23 (a) A dot plot is shown next.



(b) $\bar{X}_{1980} = 395.1$ and $\bar{X}_{1990} = 160.2$.